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. . . . . a Review of Foreign Farm Policy, Production, and Trade

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COTTON GROWING
IN THE SOVIET UNION

. . By Louis G. Michael*

The Soviet Union, like the United States, is both a cotton-manufacturing and a cotton-growing country. Prior to the World War and again in the early twenties, it imported a significant quantity of American cotton. But this market has been lost to the United States since the adoption by the Soviet Government in 1929 of a policy of self-sufficiency in the matter of the cotton supply and expansion of domestic cotton growing. While the Russian cotton acreage and production have increased materially during the past 10 years, the Soviet Union has been using practically all of its cotton at home, and indications are that it is not very likely to export or import significant quantities of cotton within the next few years.

Prior to the last two decades of the nineteenth century, the United States supplied practically all of the cotton consumed by Russian textile mills. In the eighties, Russians began to grow cotton from American Upland seed, and production in Central Asia and Transcaucasia increased considerably. In 1890, the United States supplied 375,000 bales, 1/ more than 60 percent of the Russian mill consumption. 2/ During the next two decades, Russian mill consumption increased and, whereas the amount of cotton supplied by the United States in 1910 totaled 600,000 bales, it constituted only 36 percent of total consumption. Of the average Russian mill consumption of 1,750,000 bales during the 5 years preceding the World War, 900,000 bales, or more than half, were grown in the irrigated regions of Russian Central Asia and Transcaucasia and the rest imported, largely from the United States.

During the World War and revolution that followed, Russian cotton growing as a commercial industry ceased to exist. Production by 1922 had fallen off to only 31,000 bales, grown on 174,000 acres scattered in tiny patches throughout Central Asia and Transcaucasia.

Beginning with this insignificant acreage, cotton growing in Russia has been reconstructed under the control of the Government itself, which from the outset strove to supply the needs of its textile industry as far as possible with domestically grown cotton. By 1928-29, cotton consumption was equal to the pre-war level of 1,750,000 bales, of which about two-thirds was domestically grown. See table 1.

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*Agricultural Attaché, Belgrade, Yugoslavia. Based in large part on official Soviet publications, supplemented by personal observations in the cotton regions of European Russia and Transcaucasia.

1/ All bales referred to in this report are of 478 pounds.

2/ Including Polish and Baltic industries formerly within Russian frontiers.

Table 1. Cotton lint production and consumption in the Soviet Union, 1936 with comparisons

Year	Production	Mill consumption		
		Total	Distribution a/	
			Domestic	Foreign
	Million bales	Million bales	Percent	Percent
Average 1909-10 to 1913-14	0.90	1.75	52.2	47.8
1924-25	0.45	0.98	42.3	57.7
1925-26	0.78	1.23	61.5	38.5
1926-27	0.83	1.42	54.9	45.1
1927-28	1.10	1.63	59.0	41.0
1928-29	1.12	1.75	66.6	33.4
1929-30	1.22	1.50	80.7	19.3
1930	1.59	b/	b/	b/
1931	1.84	1.61	86.4	13.6
1932	1.82	1.88	94.8	5.2
1933	1.89	1.87	97.4	2.6
1934	1.74	c/ 2.05	-	-
1935	d/ 2.25	d/e/ 2.02	-	-
1936	d/ 3.25	d/e/ 2.75	-	-

a/ Percentage of domestic or foreign lint used in any given year does not pertain to the production or importation during that year.

b/ Not reported on calendar-year basis.

c/ Compiled from rounded figure in *Socialist Construction in U.S.S.R.*, Moscow, 1936, p. 227.

d/ Preliminary.

e/ *Narodno-Khozyaistvenyi Plan Soiuza S.S.R. na 1937 god*, Moscow, 1937, pp. 98-99.

Production 1909-10 to 1913-14 and 1924-25 to 1927-28 compiled from official sources and estimates of the Bureau of Agricultural Economics. Converted on the basis of 31 pounds of lint to 100 pounds of seed cotton. Other data, except as noted, compiled from *Ekonomika Khlopkootchistitelnoi Promyshlenosti*, Moscow, 1937. pp. 12 and 16.

Soon after the inauguration of the First Five-Year Plan, the Central Committee of the All-Russian Communist Party issued the following decree July 18, 1929, designed to speed up domestic production and decrease imports.

"The development of cotton production in the current 5-year period (1928 to 1932) must follow the lines of a maximum utilization of all resources for the increase of cotton acreage and the increase of cotton yields in order to be able at the end of 5 years (1932) to free the textile industry of the Union from the necessity of importing foreign cotton, and also to have the necessary (reserve) stocks for further development of the textile industry." 3/

In 1933, 97 percent of the 1,870,000 bales consumed in Soviet mills was reported to have been grown in the Soviet Union. There is no official estimate after 1933 of the percentage of foreign cotton consumed each year by Soviet textile mills; but imports, as shown in table 2, were small.

The proportion of American cotton used in Russian mills has dwindled from about one-third in 1910 to practically nothing in 1937. Not only is there little likelihood of regaining any important part of the former trade in cotton with the Soviet Union, but there is the question of the Soviet Union's developing into a competitor of the United States in the markets of the world. The answer to this

3/ Djanumyan, S. A., *Economics of the Ginning Industry*, Moscow, 1937.

depends not only on the quantity and quality of the cotton that Russia can produce but also on the quantity and quality of the cotton that it consumes.

Table 2. Cotton imports into the Soviet Union by countries of origin, 1933-1936 and January-September 1937

Country from which imported	Year beginning January 1				
	1933	1934	1935	1936	a/ 1937
	Bales b/	Bales b/	Bales b/	Bales b/	Bales b/
United States..........	77,083	44,014	119,385	872	0
Egypt..................	c/	c/	c/	0	0
Iran (Persia)..........	20,492	64,874	77,138	66,042	73,859
Turkey.................	466	0	2,292	4,391	0
Others.................	5,981	5,839	5,134	5,552	9,127
Total................	104,022	114,727	203,949	76,857	82,986

a/ First 9 months only. Not reported by country since September 1937.

b/ Bales of 478 pounds.

c/ If any, included with "Others."

Official sources.

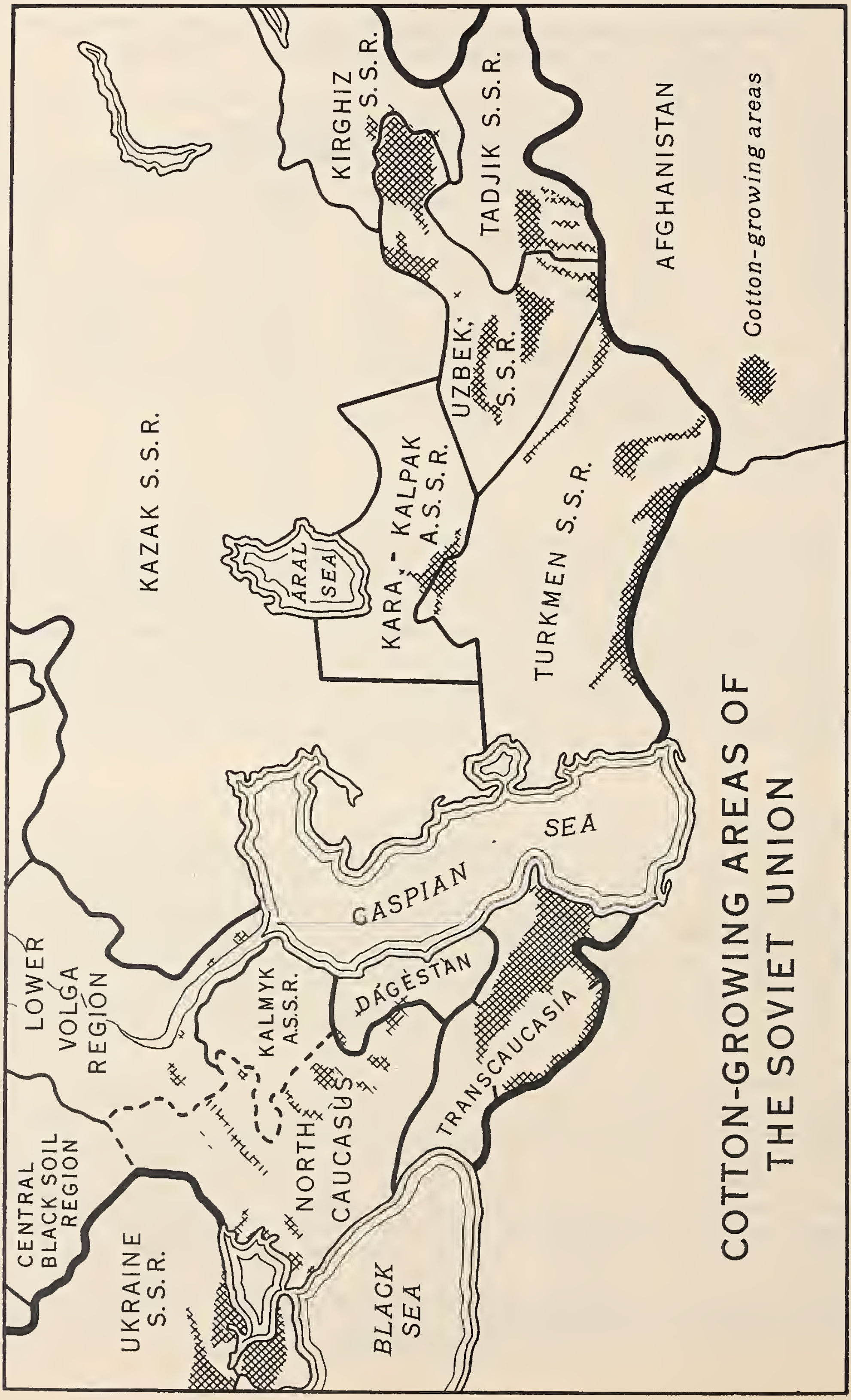
The ability to expand cotton production in the Soviet Union lies in the potentialities of its soil and climate, in the producing ability of the peoples living in those regions best suited to growing cotton, and in the driving force of a Government determined to make the country independent of foreign supplies. To judge the significance of the changes that have taken place in their relation to possible future developments, we must know something of the cotton-growing regions and of the policies of the Government as revealed in its activities in developing the cotton industry.

THE OLD REGIONS

Central Asia

In its beginning, the cotton industry of Russia centered in Central Asia, or Turkestan. 4/ The cotton-producing districts of Central Asia lie south of latitude 45°N. and north of $35^{\circ}17'$N., in that part of the Soviet Union bounded on the west by the Caspian Sea and on the east by Chinese Turkestan or Sin-Kian. To the south are the mountain regions of Iran (Persia) and Afghanistan, and farther to the east rise the ranges of the Himalayas. The southeastern part of Central Asia, comprising the republics of Kirghizia and Tadjikstan, is ribbed with chain upon chain of lofty snow-capped mountains culminating in two of the highest peaks in the world (Mount Stalin and Mount Lenin), which reach altitudes well above 20,000 feet. From the foothills of the mountain regions, the floor of a dried-up sea extends for more than 1,200 miles toward the west and north. This plain, sloping to the Caspian and Aral Seas, is characterized by stretches of barren sands, saline steppes, and gypsum wastes. It is for the most part a bleak, wind-swept, rolling plain in winter and a broiling desert in summer. Here lie the Soviet Republics of Turkmenistan and Kara Kalpak and the southern districts of Kazakstan. On the fringe of the desert and pushing back into the foothills and valleys of the mountains to the east, is the Republic of Uzbekistan, the most important cotton-growing region in the Soviet Union.

4/ The term "Central Asia" is used loosely to include Central Asia proper (Uzbekistan, Turkmenistan, and Tadjikstan), the southern cotton-producing districts of the autonomous Republics of Kazakstan and Kara Kalpak, and certain favored valleys of western Kirghizia. It is roughly equivalent to former Russian Turkestan, Trans-Caspian Krai, the Emirate of Bukhara, and the Khanate of Khiva.



COTTON-GROWING AREAS OF THE SOVIET UNION

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The plains receive practically no rain in summer, and annual precipitation is less than 10 inches. The vast southeastern mountain region, however, forms several catch-basins for summer rain and winter snow. Here the snow accumulates until its weight forces it to flow down the canyons in the form of glaciers. In summer, these glaciers reach altitudes low enough to cause them to melt and, melting, to feed three large river systems: the Amu Daria, the Syr Daria, and, between these two, the Zeravshan. 5/ The Amu Daria and the Syr Daria, both flowing west and north, reach the Sea of Aral. The Zeravshan flows westward through a series of canals to beyond Bukhara, where, wholly consumed, it fades into the desert sands. It has no mouth. There are other lesser streams: The Vakhsh and the Pianj, which unite to form the Amu Daria; the Narin, the Kara Daria, and the Chirchik, which are tributaries to the Syr Daria. Part of the water of these rivers is used to irrigate cotton. Many other rivers, tumbling down through the foothills, end in irrigation canals and are completely used up or seep into the desert sands. Other sources of water supply are the occasional subterranean streams that flow beneath the surface of the desert and whose waters, where they emerge, result in oases. Central Asia is a region of rivers without mouths, of lakes that have no outlets, of seas whose inflow is offset by evaporation and whose salty waters never reach the ocean. 6/

For centuries nomad tribes have sought the scant pasturage on the lowland desert wastes. Other nomad bands have grazed their flocks and herds upon the Alpine steppes, and, wherever water could be found, have tilled the soil. Civilization after civilization has been built up and destroyed in this mountain-desert region by Turk, Mongol, and Tartar. The oases have probably been irrigated for thousands of years, and cotton has been a staple crop for centuries. An early reference to cotton growing in this region was made more than 700 years ago at the time of the coming of the Mongol hordes under Genghis Khan. Chang Chun, a Chinese wise man who traveled to Samarkand about 1222, wrote:

> "It is here they make the stuff called 'tu-lu-ma,' which gave rise to a popular story about a material made from sheeps' wool planted in the ground. 7/ It is like Chinese willow-down, very fine, soft, and clean. Out of it they make thread, ropes, cloth, and wadding. The farmers irrigated their fields with canals; but the only method employed by the people of these parts is to dip a pitcher and carry it on the head. Our Chinese buckets delighted them. 'You Chinese are so clever at everything,' they said." 8/

The Uzbeks and their predecessors have grown varieties of a cotton called Guzah since time immemorial. Guzah cotton *(Gossupium herbaceum L.)* is probably of Indian origin and entered Central Asia through Persia. It is a coarse-fibered short-stapled cotton, developing in hard bolls that do not completely open when ripe. It is hardy and can resist drought; otherwise it could never have survived the inadequate irrigation and the primitive methods of agriculture employed.

The trading caravans of plodding camels first brought yarn of spun Guzah and later unspun cotton across the deserts over the ancient trade route to Orenburg, south of the Ural Mountains, for use in the household looms of Russia: But, after

5/ Adapted from A. P. Davis, "Irrigation in Turkestan," *Civil Engineering*, January 1932, Vol. 2, No. 1.

6/ Mikhailov, N., *Soviet Geography*, Methven, London, 1935.

7/ During the Middle Ages, a legend circulated in Europe that in Tartary there grew a plant that produced tiny lambs of flesh and blood, whose wool was wonderously white and fine. An English traveler claims to have eaten these "vegetable lambs" and to have found their flesh delicious. (F. Wilkinson, *History of the Cotton Plant*, 1919, pp. 9-19.)

8/ Fox, Ralph, *Genghis Khan*, 1936, p. 149.

the ban on exports of textile machinery from England was lifted in the 1840's and the Russian spinning and weaving industry assumed important proportions, Russian spindles were supplied for the most part by cotton from the United States. 9/

Early in the nineteenth century, trouble arose between the Central Asiatic states and Imperial Russia. Whatever the initial cause, punitive expeditions sent out by the Tzar's military command developed into a war of conquest that made Turkestan a part of the Russian Empire.

To consolidate their hard-won cotton-producing territories and to speed up the transportation of cotton to the textile centers in European Russia, railroads were constructed connecting the inland country with the Caspian Sea and later directly with European Russia by following roughly the ancient trade route from Orenburg to Tashkent, the present capital of Uzbekistan.

In the seventies, after trying out Sea Island cotton without much success, the Russians turned with much better results to American Upland varieties. These began to supplant the coarse-fibered, short-stapled Guzah and, by the beginning of the World War, the latter had practically disappeared as a commercial crop in Central Asia. The former Russian Government encouraged the pre-war expansion of cotton growing in Central Asia through the construction of new irrigation canals and the improvement of old ones. 10/ Technical assistance was rendered to growers by experimental breeding stations and by cotton specialists.

By 1913, the cotton area of the Russian Empire had reached 1,700,000 acres, which under the stimulation of high prices during the World War increased to more than 2,000,000 acres in 1915. Of this acreage, Central Asia accounted for 88 percent, whereas only 12 percent was planted in Transcaucasia.

Transcaucasia

Westward from Central Asia, across the Caspian Sea and south of the lofty, snowcapped range of the Caucasus Mountains, which mark the dividing line between Europe and Asia, lies Transcaucasia. This land is divided by the Syrian Mountains into two areas of entirely different character. To the west, the land falls away to the shores of the warm Black Sea and lies open to warm winds from that direction and is sheltered from the cold winds of the north by the main range of the Caucasus. This is Georgia, which the natives call "Gruzi" - a country of sunshine and warmth. The farm lands on the western slopes of Georgia are largely devoted to the production of commodities more valuable than cotton - citrus and other fruit, tea, etc.

The eastern part of Transcaucasia slopes toward the Caspian Sea and lies open to the dry east winds from the Central Asiatic deserts. The climate is arid, and there are vast stretches of steppe, semidesert and desert land, uninhabited and

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9/ Volin, Lazar, Section on Russia in "Report on the World Cotton Situation," prepared in the Bureau of Agricultural Economics, Washington, April 1935.

10/ The construction of these canals was most primitive. There were no sluices to control the flow of water into the canals. There was usually a dam, made of such materials as were near at hand, where the canal left the river to insure the entrance of a sufficient quantity of water. These primitive dams required repair each year but were cheap. Water was carried over depressions by aqueducts of wood, and these required repair almost every year. It was estimated before the World War that 700,000 days' work per year were expended on conditioning the canals in the Khiva district, Khorezm Oasis. The former Russian Government tried to bring order out of this chaos but gave it up as a bad job and left the control of water in local hands. *Rossiia,* St.Petersburg, 1913, Vol. XIX.

waterless. This is Azerbaijan, the most important cotton-growing district of Transcaucasia, through which, from the Gruzi highlands, flows the Kura River.

Just before the Kura empties into the Caspian Sea, it is joined by the Araxes, which rises in Turkey and, flowing around the range of the lesser Caucasus, forms part of the boundary line between Transcaucasia, Turkey, and Persia. The lesser Caucasus is a vast volcanic region, composed of three great tablelands lying high above the sea and shut in by the encircling mountains. Armenia, the third Republic in Transcaucasia, is situated in the south-central part of the area and is largely tableland, with an elevation of from 2,600 to 5,000 feet.

Primitive varieties of cotton were grown in Transcaucasia until the latter part of the nineteenth century, when they were replaced by American varieties introduced by the Russian Government. 11/

There is, today, only a small area under cotton in Armenia and a still smaller acreage in Georgia. But in Azerbaijan, where the lower valley of the Kura widens out into the bottom lands of a dried-up arm of the Caspian Sea to form the Mugan Steppe, long-staple Egyptian cotton is grown under irrigation. The upper waters of the Kura, the Araxes, and several lesser streams flowing down from the mountains through foothill valleys are used to irrigate cotton of American origin - long-staple in the lowlands, quick-maturing, short-staple in the higher elevations. Areas "under contract" to be devoted to cotton in 1937 were reported at 44,000 acres in Armenia, 10,000 acres in Georgia, 470,500 acres in Azerbaijan; of the latter, 124,000 acres were planted to Egyptian and 346,500 acres to American. 12/

Although there is considerable rainfall in the Black Sea littoral of Georgia, most of Transcaucasia lies in the "rain shodow" of the Caucasus Mountains where there is no rain of agricultural significance in summer and, except in the lesser Caucasus Mountains, little rain in any season. Practically all farming is dependent on irrigation with glacial water from the snowcapped peaks of the high Caucasus or from rain and snow falling in the mountains. In 1932, the total area of land under cultivation in Transcaucasia was only 3,264,000 acres, of which 3,000,000 acres were under irrigation: 408,000 acres in Armenia, 556,000 acres in Georgia, and 2,036,000 acres in Azerbaijan. 13/ Nine-tenths of the latter Republic remains wilderness, furnishing scant pasturage in winter and becoming a parched desert in summer.

Bread, water, and the cotton acreage

The pre-war expansion of cotton acreage in Russia was largely at the expense of the wheat and barley acreage in the irrigated oases; and, even before the World War, Central Asia and Transcaucasia were deficit in bread grains. That is, the best of the irrigated lands were devoted to cotton; whereas other crops were, to a large extent, crowded off onto the unirrigated lands, the so-called *bogara* lands. The *bogara* lands consist of the areas bordering the oases that are not irrigated in years of short water supplies and of land too elevated to be served by the canals. *Bogara* seeding depends for success upon moisture from spring and fall rains and winter snows. There is, as a rule, no summer rainfall of agricultural significance in most parts of Central Asia. 14/

11/ Petrovich, P., *Cotton Growing in Transcaucasia*, Tiflis, 1912. Quoted by Volin, *op. cit.*

12/ *Kontraktatziya i Zagotovki Khlopka*, Moscow, 1937.

13/ *World Cotton Production and Trade*, International Institute of Agriculture.

14/ "Turkestan Krai," *Rossiia*, St. Petersburg, 1913, XIX: 427-431. A similar situation exists in Transcaucasia.

Bogara lands are planted with quick-maturing varieties of wheat, barley, millet, etc., which complete their crucial growth before the coming of the summer heat. Yields of these marginal lands were always low, and crop failures were frequent. Although yields of grain on irrigated lands were more dependable, acreage was relatively small, and pre-war production in Central Asia and Transcaucasia was not sufficient to meet requirements. Varying quantities of wheat and flour, as well as of feed grains, had to be shipped into Central Asia and Transcaucasia each year from the grain-surplus regions of Russia, in exchange for cotton. Consequently, during the World War when such shipments of cereals were curtailed, and later when revolution and civil strife completely shut off both the demand for cotton in European Russia and the compensating grain supply, starvation threatened the populations of Central Asia and Transcaucasia. The farmers in these regions, therefore, shifted from cotton to foodstuffs, to feed grains, and to forage crops.

In 1921-22, when the Government undertook to increase cotton production, the peasants, because of the near famine they had experienced, did not look with favor on such a proposal. They were hesitant to give up the production of food and feed crops and plant their best lands to cotton. 15/

In order to shift acreage back to cotton in Central Asia and Transcaucasia, the cotton-procurement agencies of the Soviet Government had to offer special inducements to each individual farmer to persuade him to sign a contract to grow a specified quantity of cotton on a certain acreage. The chief inducement was that those signing contracts were entitled to purchase, at low prices, food, feed, fodder, implements, fertilizers, seeds, etc., as well as certain goods that were otherwise practically unobtainable. The success of the contract system is evidenced by the fact that between 1922 and 1938 the cotton acreage of Central Asia and Transcaucasia was increased from 174,000 to 2,394,000 acres, or to nearly 400,000 acres above the prerevolutionary peak.

As the landlords were driven out, the cotton-growing farmers took possession of the land they had formerly farmed as tenants. The redistribution was largely one of ownership and did not materially change the average acreage cultivated by each peasant. In the important Fergana cotton-growing district, 84 percent of the peasants farmed areas of 8 acres or less prior to the redistribution, and 87 percent were in this range after the redistribution. 16/ Hundreds of thousands of families cultivated independently their several little plots of ground scattered here and there in the irrigated and *bogara* lands surrounding each farming village.

Although it succeeded in increasing the cotton acreage, the system of contracts with hundreds of thousands of individual small farmers was cumbersome. In 1929-30, early in the period of the First Five-Year Plan, a drive was begun to break up independent farming and to unite peasant farmers into socialized producing groups. The strip system of farming was rapidly abandoned, and the hundreds of tiny plots formerly farmed independently by individual households in each community were consolidated into a few large fields that could be tilled with power machinery and on which modern methods of agriculture could be introduced and rational systems of crop rotation could be established. The large fields comprising these collective farms are now worked by the formerly independent peasant farmers. The organization of

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15/ The close balance between cotton and grain, requiring a supplemental supply of food from outside sources, has been a problem of long standing in Central Asia. Describing conditions in Turkestan 700 years ago, Ralph Fox writes: "The growth of commerce with the Nomads meant that more land had to be given up to cotton to provide them (the Mongols) with ropes, clothes, and materials they needed, and so ever increased the danger of famine when the burden of war and taxation made it impossible to buy food." *Genghis Khan*, p. 149.

16/ *National Economy of Central Asia in Figures*, p. 50, quoted by Volin, *op. cit.*

the collective-farm system has resulted in a rapid expansion of acreage. Cotton acreage in Central Asia nearly doubled between 1928 and 1931, reaching the all-time peak of 3,800,000 acres in the latter year. The peak of 619,000 acres was reached in Transcaucasia in 1932.

Table 3. Cotton acreage in specified regions of the Soviet Union, 1928 to 1937

Year	Old irrigated regions a/		New regions not irrigated b/	Total
	Central Asia	Transcaucasia		
	1,000 acres	1,000 acres	1,000 acres	1,000 acres
1928................	2,069	325	6	2,400
1929................	2,245	334	26	2,608
1930................	3,154	396	361	3,911
1931................	3,802	604	875	5,281
1932................	3,687	619	1,061	5,367
1933................	3,535	583	952	5,070
1934................	3,344	548	895	4,787
1935................	c/ 3,376	c/ 536	c/ 915	4,827
1936................	c/ 3,368	c/ 534	c/ 1,075	d/ 4,977
1937................	c/ 3,357	c/ 525	c/ 1,278	e/ 5,160

a/ In the irrigated regions, crops are also produced on lands that are not irrigated (*bogara* lands).

b/ The new regions are in the European part of the Soviet Union. Cotton, as a rule, is rain grown, but just to the north of the Caucasus Mountains irrigation is also employed in certain localities. *Selskoe Khozyaistvo S.S.S.R. 1935*, p. 400.

c/ Preliminary figure.

d/ Plan.

e/ Reported acreage under contract to be planted in 1937.

Official sources.

In order to expand the acreage of cotton in Central Asia, it has been necessary to give the farmers additional guaranties of an adequate bread supply. To this end, a railroad, the so-called Turksib line, was built east and north into the wheat-surplus regions of Siberia. Government bakeries and bread shops were established in the cotton-growing centers. But in spite of the effort to assure a regular bread supply, cotton acreage could not expand indefinitely. By 1931, it exceeded the capacities of some local farmers to handle the crop at picking time and strained the normal limits of some of the existing irrigation systems. Consequently, there was a reaction during 1933 and 1934, accompanied by a general decrease in cotton acreage, as shown in table 3.

During the 4 years 1934-1937, cotton acreages in the irrigated regions of Central Asia averaged around 3,400,000 acres. In Transcaucasia, irrigated cotton acreage showed a downward trend to about 530,000 acres in 1936, and in 1937 contracts were made for only 525,000 acres.

In Central Asia, wheat has been practically crowded off irrigated lands by cotton, as indicated by table 4. In Transcaucasia, to a lesser extent, the substitution of cotton for wheat has reached its practical limits, chiefly on account of lack of water readily available for irrigation. The problem of materially expanding the cotton acreage in Central Asia is practically that of increasing the area of land under irrigation. There is good land surrounding most of the villages and towns of Central Asia, but it has been impossible to increase the irrigated area to any great extent because of the limited capacity of the canals to carry water and the limited or irregular water supply.

Table 4. Acreage of specified crops seeded on irrigated and *bogara* lands in the cotton-growing regions of Uzbekistan, 1935

Specified crop	Irrigated land	*Bogara* land	Total
	1,000 acres	1,000 acres	1,000 acres
Cotton	2,168.6	18.7	2,187.3
Alfalfa	358.5	19.6	378.1
Wheat	123.8	2,174.2	2,298.0
Other grains	410.9	549.6	960.5
Vegetables, etc	149.0	14.1	163.1
Other crops	64.0	42.2	106.2
Total	3,274.8	2,818.4	6,093.2

Compiled from official rounded totals for specified crops in Uzbekistan, less the acreages of three regions that are located in high valleys and produce no cotton, as published in *Posevnye Ploshtchadi S.S.S.R. (po administrativnim Raionam) 1935*, Moscow, pp. 323-333.

The situation in Transcaucasia is similar to that in Central Asia. Cotton acreage in these two regions can be materially increased only by extending the irrigation facilities. There are several ways of doing this: (1) Reconstructing (widening and deepening) certain of the existing canal systems to increase their carrying capacity wherever sufficient water is available; (2) constructing retention dams for the purpose of conserving the flood waters; (3) utilizing streams whose waters are not already appropriated. Much has been done in recent years to increase the capacity and efficiency of the existing canal systems, but this work has not as yet greatly added to the total irrigated acreage.

In Central Asia, among the irrigation systems that have been constructed and improved are the Dalverzin, the Golodnaia Steppe, the Chardaryin on the Syr Daria; the Choish on the Chom; the Kum Kurgan on the Sukhan Daria; and the extensive developments of the Vakhsh River system. In the lower Amu Daria, also, 70,000 ancient wooden wheels, "chigiss," are being replaced by modern pumping systems. In Transcaucasia, the Little Sardarabad, the Alzan, and the Tiripon systems have been constructed and the Orjonikidzev canal has been built. 17/ There are ambitious plans for the future; but under ordinary conditions such construction has been and will be costly.

The further expansion of cotton acreage in Central Asia and Transcaucasia has become so complicated by problems of rational crop rotation and of adequate labor supply, as well as by the cost of construction of the extensive irrigation works, that cheaper means of increasing the acreage has had to be found; so "cotton sought new regions where it might be grown without irrigation and where planting areas might be rapidly and cheaply expanded." 18/

17/ Mikhailov, N., *Soviet Geography*, p. 128.

18/ *Ibid.*, p. 5.

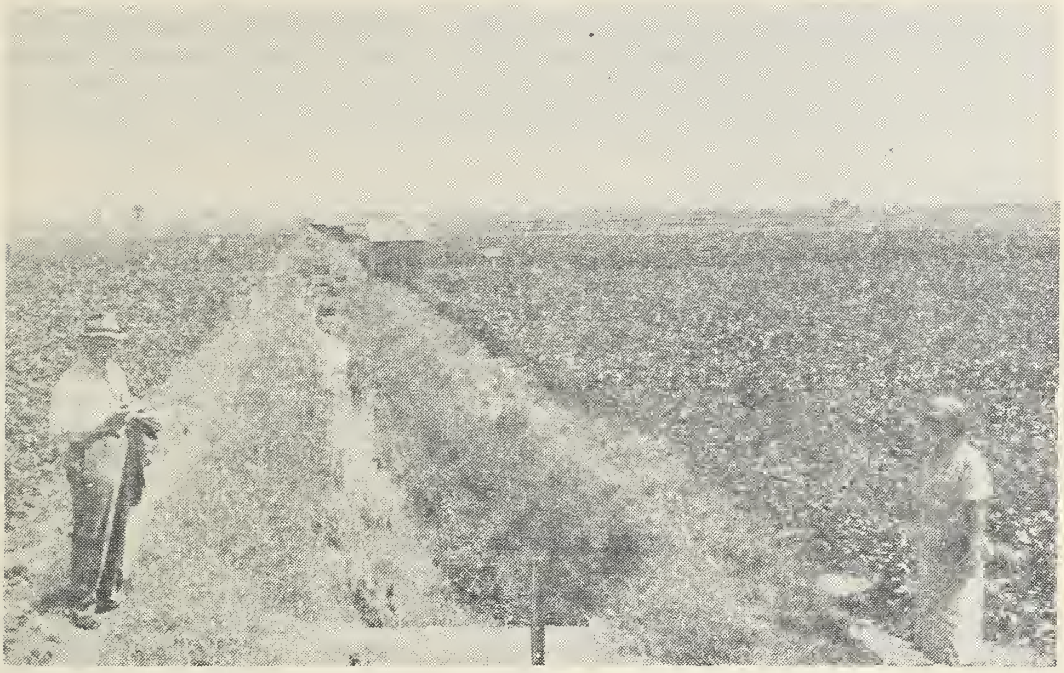

Fig. 2. One of the main ditches used to irrigate cotton at the Kirov Abad Cotton Breeding and Experiment Station.

THE NEW REGIONS

To the north of the Caucasus Mountains, along the eastern shore of the Azov and Black Seas and on the northern shores of the Black and Caspian Seas, there lies a stretch of extensive though sparsely populated, and fertile though dry, land reaching from the borders of Bessarabia to the lower Volga. Rain is infrequent here, though it falls more often than in Central Asia or in eastern Transcaucasia, and irrigation is not employed.

The idea of growing cotton in European Russia is not a new one, but cotton was never grown on a commercial scale until the present decade. The new regions offer certain advantages over the irrigated areas. Tractors can be used more easily, the area is nearer to the center of the textile-manufacturing industry, and transportation facilities are better. On the other hand, cotton yields in the new regions are markedly lower than in the old irrigated districts, and the quality of the fiber is poor. Thus, in 1934 the official figures of yields averaged only 19 pounds of lint per acre in the new regions and 202 pounds in the old regions; in 1935, the preliminary figures were 69 and 285 pounds, respectively. The growing season is relatively short, and there is greater danger of frost injury than in the present cotton-growing centers of Transcaucasia and Central Asia. Only the quick-maturing varieties of cotton have been grown with any measure of success.

The expansion of cotton acreage in the new regions was rapid during the period of the First Five-Year Plan (1928 to 1932), because several localities were found that were better suited for cotton growing than most of the available *bogara* lands in Central Asia or Transcaucasia. The area devoted to cotton in the new regions increased from about 6,000 acres in 1928 to over 1,000,000 in 1932. The expansion, however, was accompanied by very low yields. Retrenchment followed in 1933 and 1934, but since 1935 expansion has been resumed once more. See table 3 Moreover, experimental plantings on dozens of small plots were made in 1937 to determine the suitability of soil and climatic conditions north of the present northern boundary of the new regions.

It is improbable that any marked expansion of cotton acreage in eigher Central Asia or Transcaucasia will or can take place until after the construction of costly irrigation works. It is probable that further expansion of acreage in the new regions will follow in the wake of cautious experimental plantings. Future developments in the cotton-growing industry of the Soviet Union, however, are more likely to take the line of increasing the yields and of improving the quality of the product than that of any marked expansion of acreage. The basic factors determining yields are the soil itself and the degree to which its deficiencies are offset by fertilizers, the character of the seed supply planted, and the cultural methods applied to cope with climatic and other conditions.

SOILS AND FERTILIZERS

Irrigated lands of Central Asia consist, for the most part, of Gray soils. The Chestnut soils found in the foothills merge into Black soils at higher elevations. The Gray soils have a sufficient potash content but are low in humus and phosphorus and deficient in nitrogen. Leguminous crops are therefore used, and fertilizers containing phosphorus and nitrogen are applied.

Irrigation has, as elsewhere, accentuated the problem of alkaline soils. More than 50 percent of the cotton lands is alkaline. In some districts of the Golodnaia Steppe, cotton had to be abandoned on this account after high yields during the first year. The general soil situation in Transcaucasia is roughly similar to that in Central Asia.

In the new regions, most of the cotton acreage at present is found on the light Chestnut soils, such as those that lie between the sandy shores of the Black Sea and the Black-soil belt to the north. While cotton can be grown on these soils, success has been attained only in spots of rather limited area. The Chestnut soils extend southward into Crimea and eastward around the Sea of Azov up into the northern Caucasus districts and Dagestan on the Caspian Sea. This region lies in the zone of light rainfall, and the soils are little leached. They are low in humus and nitrogen. Most of them respond to applications of fertilizers containing phosphorus; and, although as a rule there is not a deficiency of potash, this fertilizer can be applied to some soils with profit. In certain parts of the new regions in North Caucasus, alfalfa makes satisfactory growth and is being introduced as a predecessor to cotton in the rotation. But in southern Ukraine, greater dependence has to be placed on commercial nitrogen and barnyard manure.

Most of the cotton-growing regions of the Soviet Union are steppe or desert regions where wood is scarce. In such areas, barnyard manure, mixed with straw and dried, is used as fuel. The great slaughter of livestock between 1928 and 1932 and the demand for fuel nearly eliminated the use of barnyard manure as a fertilizer during this period. In 1932, manures were applied to only 15 percent of the cotton lands of Central Asia and Transcaucasia.

During subsequent years, the use of barnyard manure for fertilizer increased considerably, as shown by table 5; but the expansion was more remarkable in the use of mineral fertilizers. The Government specifies in the acreage contract how much and what fertilizer shall be used. There is no record of the quantities of fertilizers used in the new regions, though their application probably has not been so general as in the irrigated regions. The use of fertilizers has undoubtedly played an important part in developing cotton production in the European area.

Table 5. Percentage of cotton acreage fertilized in Central Asia and Transcaucasia, 1932-1935

Year	By mineral fertilizer	By barnyard manure	Total
	Percent	Percent	Percent
1932	4.9	15.2	20.1
1933	3.4	43.5	46.9
1934	27.4	31.8	59.2
1935	37.2	31.6	68.8

Selskoe Khozyaistvo S.S.S.R. 1935, Moscow, 1936.

SEED SUPPLY, REORGANIZATION, AND YIELDS

In 1913, the yield of cotton in the former Russian Empire, that is, in Central Asia and Transcaucasia, averaged about 304 pounds of lint per acre, as shown in table 6.

During and immediately following the war, both production and yield declined disastrously. The landed proprietors, who had been interested in their tenants' producing high-grade cotton, had been driven out; and the buyers for the big textile mills in European Russia, who had been interested in supplying growers with improved cotton seed, no longer existed. The peasants who grew cotton for their own needs planted any kind of seed they could get, paying little attention to yield and showing little or no appreciation of the significance of varieties in their relation to yield and quality. As a result, the estimated average yield in 1922 was only 151 pounds of lint per acre.

At the beginning of the reconstruction period (1922), the procurement division of the Soviet textile industry distributed to growers under the contract system limited amounts of pure seed. 19/ In 1921, it was reported there were only about 18 short tons of seed of the variety Navrotsky developed in 1913 from the American type Russell, and even less of other standard varieties. During the succeeding years, breeding stations specializing in cotton concentrated on the production of new high-yielding strains specially adapted to specific local conditions. Several such strains were developed, although their influence on yields was not fully realized because of the farming methods employed at that time. Primitive methods of the ancient strip system of farming, based on customs and habits handed down from father to son, prevailed with little modification.

Although a beginning had been made in agronomic extension work, material results were not evident. In spite of handicaps, however, and because of the highly intensive character of the small-peasant farming, yields in 1928 averaged 234 pounds of lint per acre. This was, nevertheless, 70 pounds below the 1913 average of 304 pounds per acre. See table 6.

19/ Djanumyan, S. A., *op. cit.*, p. 11.

During the period 1928-1932 (the First Five-Year Plan period), yields declined sharply. The reason for this was that Soviet agriculture was undergoing many important changes. The ancient strip system of farming was being abandoned. The most skilful farmers - the kulaks - were being driven out. The hundreds of small plots of ground surrounding each village were being consolidated into a few large fields and turned over to the former landless or poorer peasants. The number of agronomic advisers (county agents) to handle the situation was inadequate, and few of these had had any experience in large-scale farming.

Although many acres were added to the collective-farm system, the new collective farmers were unaccustomed to the recently initiated order of agriculture and often resisted it passively, if not actively. Thousands of acres were on marginal *bogara* land in the irrigated regions. Furthermore, by 1932 nearly 20 percent of the cotton acreage had been extended into the unirrigated regions of southern European Russia, where farmers had had no previous experience in growing this crop and where, in many localities, it was impossible to obtain high yields on account of the shortness of the season and the light rainfall.

Large numbers of farm animals had been slaughtered between 1928 and 1933, and there were not enough draft animals on farms to supply the needed traction. The Government then organized machine-tractor stations (M.T.S.) in the chief production centers and threw hundreds of tractors into the cotton-growing regions. Tractor drivers (hastily trained members of collective farms), however, had not yet acquired the desired operating skill. Attempts were made to direct agricultural operations from centers at too great a distance from local activities, and serious mistakes were made.

Yields per acre suffered during this haphazard, experimental stage; and, in 1932, the average yield of cotton was barely 162 pounds of lint per acre, or only slightly more than half the 1913 yield, whereas acreage was more than trebled. It was obvious that, if the increased acreage could be maintained and yields brought up to the prerevolution level, production could be nearly doubled. During the period of the Second Five-Year Plan (1933-1937), a drive for higher yields was instituted.

Table 6. Cotton acreage, production, and yield in the Soviet Union, with comparisons

Year	Acreage	Lint	
		Production a/	Yield per acre
	1,000 acres	1,000 bales	Pounds
1913	1,700	1,104	304
1922	174	55	151
1928	2,400	1,172	234
1932	5,139	1,816	162
1933	5,070	1,887	178
1934	4,787	1,738	174
1935	4,827	b/ 2,250	b/ 224
1936	5,023	b/ 3,250	b/ 309

a/ Bales of 478 pounds.

b/ Estimates of the Bureau of Agricultural Economics.

Compiled from official sources and International Institute of Agriculture.

An important factor in raising yields is the seed supply, with which many serious difficulties were experienced. Four scientific cotton-breeding stations have recently been given charge of all cotton-breeding operations in their respective regions: the Tashkent Station for Central Asia; the Kirov Abad Station for Transcaucasia; the Kherson Station for the Ukraine; and the Khazov Yourt Station for the rest of the European part of the Soviet Union. These central stations control a network of substations and testing fields scattered throughout their territories. All cotton-breeding work is directed by the Commissariat of Agriculture in Moscow.

By 1936, the cotton-growing districts had been grouped into fairly well-defined regions, based on conditions of soil and climate. The central breeding stations and their substations endeavored to select new strains of high-yielding cotton from known standard varieties by selections and hybridization. Many varieties have been imported from abroad and tested. Certain varieties that had been popular and widely distributed have been discarded as they have proved, in the variety-testing plots scattered throughout the cotton-growing regions, to be inferior to newly created strains. Several superior varieties were developed: No. 114 from Dekhkan, No. 491 from Acala, and No. 36 M-2 from Acala. These varieties were released for general distribution during the period of the Second Five-Year Plan and have had an influence on yield. Other varieties of recent origin are still in the variety-test stage and will be released if, and as soon as, they prove to be superior to strains already in use.

In 1936, the Government specified in its contracts with the growers, and undertook to distribute to each of the collective and independent farms, the particular variety of seed that was considered, at the time, best adapted to the zone in which the farm was located.

Not only does the Government prescribe the seed supply to be used on each farm but, as will be shown in the next section, it likewise supervises through its agents almost every phase of field work. The care exercised in supplying good seed has undoubtedly increased both production and yield in recent years, as shown in table 6. The measures adopted by the Government to insure increased use of fertilizers and the application of better production practices have played their part. Equally, if not more, important are the efforts to stimulate peasants on collective farms to produce more by a piece-work system of payment and by price premiums for larger output.

The marked development in the skill of the farmers themselves must not be overlooked. The accomplishments of the best among them, so-called Stakhanovists or pacemakers, are published and broadcast throughout the Soviet Union. The working force of a collective farm is divided into brigades and smaller units (zveno), each of which is responsible for a certain definite acreage. Competition between the brigades as between the individual workers is strongly encouraged; the industrious are awarded premiums and the laggards are penalized.

GOVERNMENT CONTROL OF COTTON GROWING

The Soviet Government owns all textile mills and gins and closely supervises the growing of cotton by peasants, who are for the most part organized into collective farms. In addition, the Government owns and operates farms of its own.

The civic authorities of each raion (county) in the Soviet Union have actual supervision over all agricultural activities within their respective county. A representative of the county council (Raispolkom) is a witness to each contract that the agent of the Government procuring organization makes with each collective farm growing cotton. This contract, which "contains a complex of obligatory and necessary requirements as to production," has been given "the force of a law,"[20] and any violation of its terms subjects an independent farmer or a collective-farm group to legal prosecution and punishment. Thus, advice offered by the agronomic division of the county civic administration has, within the terms of the contract, the force of a command to be obeyed. The actual routine work of directing the farming activities of collective farmers, however, is performed largely by the agronomic section of the local machine-tractor station, one or more of which operate in each cotton-growing center.

THE ROLE OF MACHINE-TRACTOR STATIONS

The machine-tractor stations, owned and operated by the Government, have been powerful factors in the organization of many collective farms and in the direction of their policies. The machine-tractor station has three sections: the mechanical, the agronomic, and the political. A specialist appointed and employed by the Soviet Government is in charge of each section.

The mechanical section enters into a contract with a collective farm for the performance of certain farm work - plowing, harrowing, seeding, cultivating, harvesting, threshing, etc. The farm pays the wages of tractor drivers and a certain percentage or quantity of the crop per acre for the performance of each farm operation. A machine-tractor station does not serve all the collective farms in its district, as some of the collective farms are remote or located in hilly country where it is not possible to operate power-drawn machinery; nor does it supply tractors and machines to do all the work on any particular collective farm, because each farm has a certain, though varying, number of draft animals and implements of its own.

In the congested cotton-growing districts of Central Asia and Transcaucasia, a large percentage of farm operations is performed by hand or by animal-drawn implements. There is a question as to the extent to which farm operations should be mechanized and hand workers thrown out of farm employment and made available for other industries. This is particularly true in the case of the cotton-growing districts, where a large amount of hand labor is required at picking time. The mechanization of cotton picking is not the success desired by Soviet authorities. Attempts have been made to perfect a picker suited to Central Asiatic conditions, but at the end of 1937 the machine was still in the experimental stage.

Table 7. - Percentage of the total acreage plowed, seeded, and cultivated by machine-tractor stations, in specified Republics of the Soviet Union, 1936

Republic	All crops plowed		All crops seeded		Cotton	
	Fall	Spring	Fall	Spring	Seeded	Cultivated
	Percent	Percent	Percent	Percent	Percent	Percent
Uzbekistan	77	74	22	16	26	17
Turkmenistan		80	15	20	25	15
Tadjikstan	25	35	1	7	31	15
Kirghizia	91	39	35	13	30	18
Azerbaijan	42	57	18	37	70	43

M.T.S. i Kolkhozy v 1936 god., Moscow, 1937.

The agronomic section supervises all farm operations of collective farms that are served by the Government-owned machine-tractor stations. For instance, in the

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[20] *Ibid.*, p. 2.

Kherson County, Odessa Province of the Ukraine, where over 23,000 acres were planted to cotton in 1935, there are 3 machine-tractor stations, each of which has a staff of 10 agronomists. 21/ There are 83 collective farms served by these stations, so that each field agronomist supervises the work of 2 or 3 collectives. In 1935, these collectives planted about 185,000 acres to all crops, or some 2,200 acres per collective farm. Each agronomist, acting as a Government overseer, thus supervised the work done on from 4,000 to 7,000 acres. The machine-tractor stations and county authorities, in collaboration with representatives of gins, which are managed by the Commissariat of Light Industry, determined which collectives were to grow cotton, the particular fields upon which cotton was to be grown, the extent of the acreage, and all other details from the preparation of the soil to the final delivery of the raw cotton. During the growing season, the agronomists, acting under the general direction of the head agronomist of the county agricultural department, supervise every detail of cotton production on these farms.

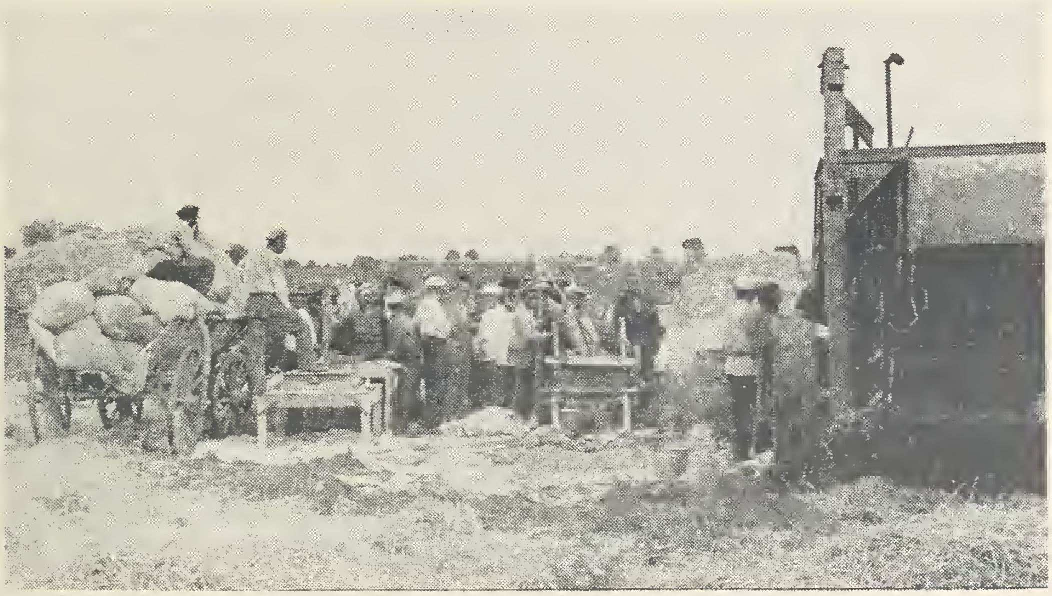

Fig. 3. Group of collective farmers in Azerbaijan, Transcaucasia.

The growth of this type of organization, in accordance with the decision of the Bolshevist Party, has been a steady one from 158 Government-owned "tractor centers" in 1930 to 2,502 in 1932 and to about 5,000 in 1936. There were 17 stations specializing in cotton in 1930 and 452 in 1935. In the early days of mechanization, great difficulty was experienced in the use of tractors for the cultivation of row crops. In recent years, this difficulty is being overcome by the use of a light universal-type tractor.

In 1935, the Soviet Unoon planted 4,827,000 acres of cotton, of which about 4,300,000 acres, or 89 percent, were planted on collective farms. These are of the

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21/ Much progress has been made in the training of the greatly needed agronomic personnel. Many of the existing agricultural middle schools, colleges, and institutes have been enlarged and new institutions established so that today hundreds of additional young men and women with 4 years or more of training are being set to work each year in the farm centers.

so-called artel type, under which the principal means of production, the land, the livestock, and the farm implements are socialized, but the peasants retain possession of their houses and a few animals, with a small plot of land for a kitchen garden. State farms, owned and operated by the Government, planted 245,000 acres, or 5 percent, and independent peasant farmers (nonsocialized farms) planted 282,000 acres, or 6 percent.

Table 8. Relative number and size of collective farms in specified regions of the Soviet Union, 1936

Item	Odessa Province, Ukraine	Azerbaijan	Uzbekistan
	Number	Number	Number
Farms	4,212	3,611	9,180
Households -			
Total	374,000	289,300	642,500
Per farm	89	80	70
	Acres	Acres	Acres
Acreage harvested -			
Total	8,371,000	2,282,000	5,811,000
Per farm	1,987	632	633
Per household	22	8	9

M.T.S. i Kolkhozy v 1936 god, Moscow, 1937.

Collective farms in different parts of the Soviet Union vary greatly in their relative size and in the relative acreages planted to cotton and other crops, as shown in table 8. In the Province of Odessa, southern Ukraine, on the northern margin of the new-region cotton belt, cultivated lands stretch away continuously for hundreds of miles, dotted here and there with farm villages. Collective farms averaged nearly 2,000 acres each in 1936. There were, on an average, 89 households to each farm, or an average of over 22 acres of crop land to each household. An extensive type of agriculture is followed in this area, and a large part of all farm operations are performed with machinery supplied by the machine-tractor stations.

Table 9. Acreage seeded on various types of landholdings in specified districts of the Soviet Union, 1935.

Kind of landholding	Kherson County, Odessa Province, Ukraine		Salyan County, Azerbaijan, Transcaucasia		Sokh Delta, Uzbekistan, Central Asia	
	Acres	Percent	Acres	Percent	Acres	Percent
Collective farms	185,419	74.3	77,260	87.6	196,217	94.7
Holdings of collective farmers a/	4,040	1.6	--		4,927	2.4
State farms	56,351	22.6	7,427	8.4	3,254	1.6
Independent farms	902	0.4	3,503	4.0	2,708	1.3
Holdings of factory and other workers	2,676	1.1	--		67	0.0
Total	249,388	100.0	88,190	100.0	207,173	100.0

a/ In addition to the fields farmed by the collective group, each household in most localities has a small plot of land for a kitchen garden.

Posevnye Ploshtchadi S.S.S.R., Moscow, 1936.

In Azerbaijan (Transcaucasia) and in Uzbekistan (Central Asia), the population is, for the most part, crowded onto the limited land of oases, scattered in the deserts, where irrigation is possible. Farm villages are also located in occasional valleys or upon hillsides where there is sufficient rainfall to furnish a precarious existence. There is usually a stretch of desert or waste land between villages or groups of villages. Collective farms are small, averaging about 632 acres of crop land each, and from 70 to 80 households. On an average, there are only 8 or 9 acres of crops per family.

Scattered here and there among the collective farms are the holdings of the few independent farmers who have resisted collectivization and who prefer to pay high taxes and undergo other inconveniences rather than to relinquish their individual activities. Finally, there are the 48 Government-owned and -operated state farms, of several thousand acres each, that specialized in cotton in 1935. There were 15 of these in the new regions, 7 in Transcaucasia, and 26 in Central Asia. The acreage seeded in three selected cotton-growing districts in 1935 was distributed among five groups of landholdings as indicated in table 9.

There is a wide range in agricultural practices being followed in the cotton-growing districts of the Soviet Union, as illustrated by the areas planted to specified crops on all types of farms in 1935 in three cotton-growing countries, as shown in table 10.

In the Kokand County of Central Asia, 82.4 percent of the irrigated area was under cotton and alfalfa and only 13.0 percent under grain; whereas, in Kherson County, 69.2 percent was under grain and only 10.0 percent under cotton and alfalfa. In Transcaucasia, a little more than half the area was under grain and a little less than half under cotton and alfalfa. Soviet authorities have recently placed much emphasis on the use of alfalfa as a rotation crop to increase cotton yields.

Table 10. Utilization of the seeded area in three selected cotton-growing counties of the Soviet Union, 1935

Crop	Kherson County, Odessa Province, Ukraine		Salyan County, Azerbaijan, Transcaucasia		Kokand County, Uzbekistan, Central Asia a/	
	Acres	Percent	Acres	Percent	Acres	Percent
Grain.................	172,589	69.2	b/ 44,992	51.0	7,240	13.0
Sunflower............	4,324	1.7	--		--	
Vegetables...........	25,086	10.1	474	0.5	2,577	4.6
Cotton...............	23,398	9.4	c/ 38,083	43.2	c/ 41,989	75.3
Alfalfa..............	1,532	0.6	4,668	5.3	3,970	7.1
Other feed and forage	21,839	8.8	5	0.0	5	0.0
Other crops..........	620	0.2	5	0.0	20	0.0
Total..............	249,388	100.0	88,227	100.0	55,801	100.0

a/ Kokand County comprises the farm lands surrounding the city of Kokand in the Sokh delta.

b/ Most of this grain was grown on unirrigated (*bogara*) land not suitable for cotton.

c/ All of this cotton was grown on irrigated land.

Posevnye Ploshtchadi S.S.S.R., Moscow, 1936.

CROP ROTATIONS

The utilization of land and the rotation of crops vary greatly in the various regions where cotton is grown. A few examples are given to illustrate the diversity in the rotations employed. On the northern fringe of the new regions, cotton is grown in a rotation of cereals - (1) fallow, (2) winter wheat, (3) spring grain, (4) cotton, (5) winter wheat, (6) potatoes and spring grain. 22/ Farther south near the Azov Sea, cotton is grown between cereals and alfalfa in the following rotation: (1) cotton, (2) winter wheat, (3) cotton, (4) barley and oats, (5) cotton, (6) winter wheat, (7) alfalfa. 23/ On the irrigated lands of the Golodnaia Steppe in the southern part of Kazakstan, Central Asia, the State Farm Pakhta Aral practiced the following crop rotation: 24/

1. Alfalfa, without fertilizer
2. Alfalfa, with phosphate fertilizer
3. Alfalfa, with phosphate fertilizer
4. Cotton, with phosphate fertilizer
5. Cotton, with phosphate fertilizer
6. Cotton, with phosphate and nitrogen fertilizer
7. Cotton, with phosphate and nitrogen fertilizer

TILLAGE METHODS

As a rule, in the new regions where moisture conservation is imperative, all land to be planted to cotton in the spring is shallow plowed after harvesting the crop the previous summer. Later in the fall, the land is plowed from 8 to 10 inches deep. Power-drawn plows furnished by the machine-tractor stations are used for most of this work.

Tillage methods vary widely from farm to farm. Though there is much room for improvement in most cases, the general technique applied to cotton growing in the Soviet Union has shown considerable progress during recent years. On the collective farm Red October, in Azov-Black Sea Province, fields were harrowed twice in March 1937. A mixed fertilizer was then applied (160 pounds per acre), and the land was plowed 4 or 5 inches deep. In April the fields were cultivated and then seeded with 62 pounds of seed per acre (from 26 to 28 inches between rows). Later the plants were thinned to from 4 to 6 inches apart in the row and a *podkormka* application of a general fertilizer (160 pounds per acre) was applied. 25/ During the growing season the fields were cultivated five times between rows, and the plants in the row were hoed seven times. About the time the bolls began to form, a third application *(podkormka)* of fertilizer (160 pounds per acre) was given. After the bolls were formed, the plants were top-pruned to let light and heat into the interior, and superfluous buds were removed by hand. This farm is reputed to have produced 1,255 pounds of seed cotton per acre in 1936, and even higher yields were expected in 1937. Such conditions, of course, are not typical but represent the best that is being achieved.

HARVESTING AND DELIVERY

Cotton ripens in September and is almost entirely hand-picked. Each picker is assigned a specified number of rows, equivalent to a certain acreage that can be

22/ Budyona Collective Farm, village of Antonovka, Kherson County, Odessa Province, Ukraine. There is no alfalfa in this rotation. The Kherson cotton experiment station is trying out the rotation (1) fallow, (2) winter wheat, (3) cotton, (4) alfalfa, (5) alfalfa, (6) alfalfa, (7) spring grain, (8) cotton, (9) winter wheat, (10) winter wheat.

23/ Red October Collective Farm, village of Stara Titerovska, Temruk County, Azov-Black Sea Province.

24/ *Pakhta Aral v 4 Zavershainstchem,* 1932, p. 15.

25/ *Podkormka* fertilization is accomplished by means of a several-row cultivator equipped with a tank for liquid manure. Tubes extend from a regulating compartment at the lower rear of the tank down the heel of each cultivator tooth. The liquid with fertilizing materials in solution and suspension is deposited about 8 inches below the surface of the ground.

gone over in 5 or more days; he is provided with a large sack, worn like an apron, with a large compartment next to the body and two or three smaller compartments in front. As the cotton is picked, it is supposed to be put into one of these pockets, according to seed-cotton grades established by the Government. Standard samples are made up with which pickers familiarize themselves before picking begins. There are five seed-cotton grades, which can be roughly characterized as follows: I, white with brilliant luster; II, white to yellow with dull appearance; III, yellow to reddish yellow; IV, deeply colored locks; and V, bollies. The first grade is subdivided into "select," "normal" (middling), and "low." Each picker exercises his own judgment as to the grade of the locks picked from each boll.

The cotton picked by each individual is weighed separately by grade, and payment is made according to the quantity picked. Preliminary weighing is done in the field, and the cotton is then hauled to the central weighing shed. If the cotton has a higher moisture content than that specified as normal to a particular seed-cotton grade, it is artificially dried. Otherwise, it is stuffed into sacks furnished by the procurement agent, weighed, and hauled to the nearest procurement point. In practice, cotton harvesting in the Soviet Union has been far from efficient and was accompanied by considerable losses of cotton even during the 1937 campaign because of delayed picking, poor storing, and inadequate drying facilities.

Fig. 4. Picking cotton at collective farm Budennovo at Anapa, Azov-Black Sea region.

According to the contract signed in 1936, each collective farm or individual producer of cotton was obligated to deliver to the warehouse at the procurement point all cotton of the harvest of 1936, but not less than a specified number of short tons of seed cotton. The minimum quantity, however, did not include the seed-cotton payments in kind made to the machine-tractor stations. 26/ No cotton is retained by

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26/ *Zagotovki Khlopka*, Moscow, 1936. This has led, in many cases, to producers' safeguarding themselves by planting an acreage in excess of that called for in the contract. As a rule, this excess acreage is not reported, and yields appear higher than those actually obtained.

producers or by the machine-tractor stations for any reason whatsoever. Seed cotton must be clean, graded, and without higher moisture content than is normal for each grade. Final payment for seed cotton is made in cash on the basis of the percentage of the seed-cotton grades making up the total quantity delivered, and the various advances made are deducted. The prices, which vary widely among the three cotton-growing regions, include a basic price plus a premium for the quantity of delivered cotton per acre over and above the contract quantity.

The lowest prices for seed cotton are paid in Central Asia where cotton growing has been a long-established industry. Prices paid to the growers in Transcaucasia, where there has been a downward trend in acreage during the 5-year period 1933-1937, are nearly 50 percent higher. Higher prices are paid for bollie cotton of American type in Transcaucasia than for white grade I (normal) in Central Asia. Higher prices are also paid for cotton grown in the new regions north of the Caucasus Mountains than are paid in Central Asia. The percentage of bollies is high in these regions, where yields per acre are unusually low. To stimulate interest in cotton growing, the Government pays farmers in the new regions a higher price for bollie cotton than for white grade I (low) in Central Asia.

Table 11. Acreage and percentage of production represented by specified grades of seed cotton in the Soviet Union, 1935

District	Acreage	Grade of seed cotton		
		I (white)	II, III, IV (tinted)	V (bollie)
	1,000 acres	Percent	Percent	Percent
GROUP I				
Transcaucasia -				
Georgia	44.5	86.3	12.9	0.8
Armenia	13.8	79.3	14.5	6.2
Azerbaijan	477.9	73.3	17.3	9.4
Central Asia -				
Turkmenistan	381.3	74.8	15.2	10.0
Uzbekistan	2,187.4	70.8	17.6	11.6
Tadjikstan	252.3	70.4	17.0	12.6
Total Group I	3,357.2			
GROUP II				
Central Asia -				
Kazakstan	279.2	66.7	21.0	12.3
Kirghizia	162.8	62.7	18.7	18.6
Kara Kalpak	113.2	48.1	34.1	17.8
New regions -				
Ordjonikidzev a/	350.6	69.3	13.2	17.5
Crimea	74.1	64.3	22.4	13.3
Ukraine	387.2	41.2	33.9	24.9
Azov-Black Sea	90.2	36.3	40.2	23.5
Other	12.6	b/	b/	b/
Total Group II	1,469.9			
Total Soviet Union	4,827.1	69.3	18.4	12.3

a/ Includes Dagestan and Tchetcheno-Ingush.

b/ Grades of seed cotton not separately specified.

Percentage of seed-cotton grades compiled from *Ekonomika Khlopkootchistitelnoi Promyshlenosti*, Moscow, 1937, p. 120; acreage from *Socialist Construction in U.S.S.R.*, Moscow, 1936, p. 277.

Not only is cotton production in the Soviet Union stimulated by price fixing and premiums to further the plans of the Government, but aid is also extended to growers by advances of seed and cash and by the sale of cottonseed products at reduced prices.

SEED, CASH, AND OTHER ADVANCES TO COTTON FARMERS

Before the beginning of the spring-planting campaign, the Government, through its procurement agents in each district, delivers to each cotton-growing collective farm and independent farmer in their district a quantity of seed sufficient to plant the acreage specified in the contract. In 1937, delivery of seed to collective farms was reported to have begun about February 1, whether the contracts had been signed or not. Each lot of seed thus delivered is supposed to be accompanied by a certificate guaranteeing the variety, the purity, and the germination test. Seed may be paid for in cash at prices ranging from 28 to 64 rubles per short ton, depending upon the degree of purity of type, or it may be sold on credit to be paid after harvest, together with interest at 3 percent.

The agents advance cash to the growers (collective farms and independent farmers) on the basis of the number of tons the growers contract to deliver. There are three such advances: (1) at the time the contract is signed; (2) after the acreage seeded has been officially verified; and (3) after the second cultivation.

The total amount of the cash advanced varies from region to region and with the different types of cotton planted. Thus, for each metric ton (2,204.6 pounds) of an American type of seed cotton specified as the minimum quantity to be delivered by a collective farm, the total sum advanced is 550 rubles in Transcaucasia, 400 rubles in the new regions, and 375 rubles in Central Asia. Advances per ton to the independent farmer whose household does all of the work are equal to about two-thirds of those made to collective farms. In Transcaucasia, advances to growers of Egyptian cotton total 1,100 rubles per estimated ton to be delivered; whereas, in Central Asia the advances total only 750 rubles. Interest at the rate of 3 percent per annum is charged on all cash advances.

According to the decree of March 7, 1935, not less than 85 percent of the advances received by cotton-growing collective farms must be distributed among the members themselves for immediate payment of part of their daily wage. From the amounts advanced, it is evident that the Soviet Government is offering growers in the new regions and in Transcaucasia greater inducements to increase cotton acreage than are being offered to the growers of Central Asia.

At the time of closing the contract and at specified times thereafter, cottonseed oil, oil cake, and linters are delivered to the grower, who pays for these products at a rate below the usual market prices.

QUALITY OF SEED COTTON

The best grades of cotton are produced in Transcaucasaa and in Turkmenistan. Cotton with a comparatively large percentage of white grades is also produced in the desert oases and valley districts of Uzbekistan and the western valley districts of Tadjikstan. Nearly 70 percent of the cotton acreage of the Soviet Union is located in these five districts (Group I, table 11), which are characterized in general (but with local exceptions) by a relatively long growing season and intense heat in midsummer. Under these conditions, cotton ripens more fully than in other regions and, in 1935, had a comparatively high percentage of grade I white cotton (70.36 to 86.30 percent). There was a relatively low percentage of bollie cotton (0.79 to 12.62 percent).

The cotton grown in Kazakstan and Kirghizia in 1935 graded 63-67 percent white grades, 19-21 percent tinted, and 12-19 percent bollie cotton. The bulk of the cotton produced in Kazakstan is grown west and north of the Oasis of Tashkent, and that produced in Kirghizia is grown largely in districts fringing the Fergana Valley of eastern Uzbekistan, the most important cotton-growing region of the Soviet Union. Climatic conditions are somewhat less favorable in Kazakstan and Kirghizia than in Uzbekistan, and the quality of the cotton produced is somewhat lower.

Kara Kalpak produces an unimportant quantity of cotton of low quality in the lower valley and delta of the Amu Daria River. This district is characterized by a relatively short growing season. In 1935, only 48 percent of the production was classified as grade I white, 34 percent as tinted, and 18 percent as bollie.

Fairly good cotton is produced in the European part of the Soviet Union in Ordjonikidzev district 27/ just north of the Caucasus Mountains. The climate of this district is modified by the hot east winds coming from the Asiatic deserts. Fairly good cotton is also produced in the Crimean Peninsula, where the climate is modified by the Black Sea. The growing period in the latter regions is slightly longer than in other parts of European Russia, and midsummer temperatures are higher. Cotton matures more rapidly, and there is less frost damage. The 1935 production in these two districts graded 64-69 percent white, 13-22 percent tinted, and 13-17 percent bollie.

The poorest cotton produced in the Soviet Union is grown in the Azov-Black Sea Province (east of the Black and Azov Seas) and in the Ukraine to the north of the Black Sea. Here the growing season is short, and midsummer temperatures are not so high during the day as in the regions to the south and drop sharply at night. A large part of the crop is not fully matured when caught by the frost. In 1935, there was a high percentage of tinted grades (from 34 to 40 percent) in the cotton produced in these districts, and only from 36 to 41 percent of the cotton delivered to the procurement agents in that year could be classed as white. About one-fourth of the crop was bollie cotton. See table 11.

Although the grade of seed cotton produced on the northern fringes of the European and Asiatic cotton-growing regions has been consistently low, the general average percentage of white grades in the production of the Soviet Union as a whole has tended to increase during recent years, 28/ largely because the varieties planted are better adapted to local conditions of soil and climate than formerly.

Table 12. Percentage of seed-cotton grades produced in the Soviet Union, 1933-1936

Year	White cotton	Tinted cotton	Bollie cotton
	Percent	Percent	Percent
1933	68.1	22.4	9.5
1934	43.9	28.9	27.2
1935	69.3	18.4	12.3
1936	73.2	19.2	7.6

It is reported that the Soviet textile industry considers the quality of the cotton produced in the Soviet Union satisfactory as regards seed-cotton grade and is now demanding that cotton breeders bend their energies chiefly toward increasing the

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27/ Includes Dagestan and Tchetcheno-Ingush.

28/ Excepting the poor crop year 1934.

length of staple without losing variety characteristics. In the endeavor to obtain high yields and better ginning percentages, the problem of the length of staple was neglected. But in recent years an improvement has been noted in length of staple as well as in yield.

VARIETY AND QUALITY

To the textile industry and cotton breeders, a particular variety name or number is now more or less synonymous with staple length, qualified by other desirable characteristics - length of growing period, ginning outturn, weight of bolls, disease resistance, etc. The present cotton-breeding problem in the Soviet Union, therefore, is largely one of producing the longest-stapled strains of cotton that will mature under the temperature and soil conditions of each of the several zones into which the cotton-growing counties have been divided.

Egyptian cotton

Egyptian cotton would meet the desires of the Soviet textile industry for length of staple, but there are only a few districts of Transcaucasia and Central Asia that have a suitable climate for maturing these late cottons. Within these districts there is either a limited amount of water available for irrigation or a limited amount of land suitably situated to permit the employment of irrigation.

The first experiments in the acclimatization of Egyptian cotton in the Soviet Union were undertaken in 1926. 29/ In 1938, only 84 acres, producing 100 bales, were planted in Turkmenistan. The following year cultivation of Egyptian cotton was extended to Tadjikstan and in 1930 to Uzbekistan. Finally, in 1931, this type of cotton was planted in Azerbaijan, where more favorable conditions were found. This is now the chief region in the Soviet Union for growing Egyptian cotton.

The expansion of the acreage of Egyptian varieties, as shown in table 13, was relatively rapid, when one takes into consideration the fact that all peasant farmers were inexperienced in growing this type of cotton, and, in some cases (particularly in Tadjikstan), in growing any kind of cotton.

During the early years of the Second Five-Year Plan period (1933-1937) several varieties of "upper" and "lower" Egyptian cotton were distributed to growers without previous acclimatization. It required only a brief period of practical experience, however, to demonstrate that many of the introduced varieties were not suited to any locality in the Soviet Union, and these varieties were discarded. Moreover, it was found that most regions were entirely unsuited to growing Egyptian cottons. Attempts to grow these cottons were therefore abandoned in districts not specially suited to the few varieties of "lower" Egyptian origin that are now planted commercially.

During the introductory period, hopes were entertained of a possible 1.5 million acres under Egyptian cotton in Central Asia alone by 1937, 30/ but this figure was later scaled down to 568,000 acres as the probable goal for the Soviet Union as a whole in that year. 31/ Even this hope was not realized. It was reported that in 1937 contracts were made for only 309,073 acres of Egyptian cotton, distributed in four regions. Three standard varieties, Fouadi, Maarad, and Pima, account for the bulk of the acreage. In addition, several recently developed varieties occupied small acreages.

29/ In Turkmenistan, by a cotton specialist named Avtonomov. *Socialist Reconstruction of Agriculture*, No.11, 1935.

30/ *Revolution and Nationalities*, Moscow, 1934, Vol.1.

31/ *Second Five-Year Plan*, Moscow, Vol. 1.

Table 13. Acreage and production of Egyptian cotton in the Soviet Union, 1931-1937

Year	Acreage	Production a/	Yield per acre a/
	Acres	Bales	Pounds
1931	52,494	--	--
1932	124,113	--	--
1933	188,646	48,427	123
1934	267,624	70,566	126
1935	285,312	95,932	161
1936	306,898	138,364	216
1937	b/ 309,073	--	--

a/ Calculated from rounded figures that were probably approximations.

b/ Plan as given in *Kontraktatziya i Zagotovki Khlopka,* Moscow, 1937, p. 32.

Acreage from 1931 to 1936 from *Socialist Reconstruction of Agriculture,* No. 2, February 1937, p. 113. Production from 1933 to 1936 from *Legkaya Promyshlenost,* 1937, I : 13.

Most of the Egyptian cotton grown in the Soviet Union in 1937 was planted on the hot bottom land, below sea level, in the lower Kura River Basin of Azerbaijan, Transcaucasia. Contracts were reported for 123,550 acres to be planted chiefly with Fouadi, characterized by a staple length of 1-11/32 to 1-1/2 inches. 32/ Contracts were reported for 74,130 acres of Egyptian cotton to be planted in the extreme south of Uzbekistan. Most of this acreage was planted with the standard variety Maarad, which under field conditions has produced a staple length of 1-17/32 to 1-27/32 inches. 33/

Egyptian cotton is also grown in the lowest southern river valleys of Tadjikstan. It is reported that in 1937 contracts were made for 66,915 acres to be planted chiefly to Pima with a staple length described to be about 1-1/2 to 1-23/32 inches. The fourth region suitable for growing Egyptian cotton is in the desert oases of Turkmenistan, where the area under contract for the crop of 1937 was reported to be 44,478 acres, planted almost exclusively to Maarad and Pima.

Although it is possible to grow varieties of Egyptian cotton in the Soviet Union with a staple length greater than that of the longest-stapled American cotton, relatively poorer yields are obtained than for the medium- to long-stapled cottons of American origin. The proportion of lint is, as a rule, less than that of the short-stapled varieties of American origin now grown.

Cotton breeders in Central Asia and Transcaucasia are striving to produce new strains of Egyptian cotton and experimenting with those already isolated to maintain staple length, to increase yield and the ginning percentage (which is low), as well as to shorten the length of the period required for maturity. Five such newly developed strains of Egyptian cotton were being given field tests in 1937.

The acreage reported to be under contract to be planted to Egyptian cotton in 1937 was only 6 percent of the total cotton acreage reported for the Soviet Union. Any future increase in Egyptian relative to the total will probably be a matter of

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32/ *Khlopok-Syretz,* Moscow, 1936, p. 74.

33/ *Standarty na sorta Khloptchatnika,* Moscow, 1935.

slow development unless means are discovered to increase the supply of water sufficiently to irrigate new areas in the four regions that have been found climatically best suited to the development of long-stapled cottons. As pointed out, such an increase in water supply cannot be made except at a very considerable expenditure of labor and capital.

Medium- to long-staple cotton of American growth

The bulk of the cotton produced in the Soviet Union is medium- to long-staple cotton of American origin. This cotton is grown on the irrigated land along river courses and in desert oases between the regions that grow Egyptian cotton in the south and those that grow short-staple cotton in the higher foothill valleys. In 1937, the Government made contracts with growers to plant seven described varieties of medium-staple cotton on about 2,791,000 acres, or on about 54.5 percent of the total cotton acreage that year.

In the regions of Central Asia where Egyptian cotton was grown in 1937, certain areas had been found to give better results when planted with cotton of American origin called 36 M-2 - a variety that under field conditions produced a staple length ranging from 1-3/16 to 1-5/16 inches. This is a variety strain developed from the American type Acala with a growing period of from 125 to 145 days. This variety was specified in 1937 contracts for 872,000 acres along the middle course of the Amu Daria, along the lower reaches of the Zeravshan, and on the fringes of the Egyptian-cotton districts in Tadjikstan, southern Uzbekistan, and the desert oases of Turkmenistan.

The leading variety of cotton grown in the Soviet Union is a medium-late variety called No. 8517, which was developed at the Central Breeding Station of Central Asia in 1929-30 from American Acala. It has a described staple length of from 1-3/32 to 1-1/4 inches and matures in 120-142 days. This variety was specified in 1937 contracts for planting 960,000 acres in Fergana in the upper valley of the Syr Daria and on farms just across the Fergana frontier in Kirghizia. No. 8517 was also specified in contracts covering 208,000 acres scattered throughout other regions in Central Asia.

The third most important cotton variety, as regards acreage planted, is a medium-early variety, called No. 2034, developed in Central Asia from the American type Express Webber. This variety has a described length of staple of from 1-7/32 to 1-11/32 inches and matures in 118-140 days. It was specified in 1937 contracts for planting on 353,000 acres in northern Uzbekistan around Tashkent and in southern Kazakstan. These three varieties were specified in 1937 contracts for planting on about 2,393,000 acres in Central Asia. About 398,000 additional acres less favorably located in Central Asia and Transcaucasia were under contract for planting to four other standard varieties with staple lengths ranging from 1-1/16 to 1-5/16 inches.

Short-staple cotton of American origin

In the new regions of European Russia and in southern Kazakstan and Kara Kalpak, to the north of the area where cotton was grown in Central Asia before the World War, 34/ the climatic conditions are marginal for the production of long- or medium-staple cotton. Cotton growing has also been pushed into the marginal areas

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34/ In Central Asia, cotton production has been extended northward to latitude 44° N., "although it was already considered risky in the neighborhood of Tashkent (41.2° N.)." See Prianishnikov, *Specialized Agriculture*, 7th edition, 1929, p. 612. Quoted by Volin, *op. cit.*

of the upper valleys in the hill districts adjacent to the old cotton regions of Transcaucasia and Uzbekistan, as well as in the hill districts of Tadjikstan and Kirghizia. The northerly latitude or the high altitude of these marginal districts so limits the growing season that only the short-stapled, or quick-maturing varieties, can be grown.

Practically all the acreage in the new regions is planted with a short-stapled variety of cotton called No. 1306 that was developed in Central Asia in 1920-21 from a variety called Shreder, which, in turn, was developed from the original American King. No. 1306 matures in 109-127 days and is characterized by a staple length of 31/32 to 1-5/32 inches. This variety was also specified in 1937 for planting in the high valleys of Transcaucasia, Tadjikstan, and Kirghizia; in the upper portion of the Oasis of Samarkand; in the Delta of the Amu Daria in Central Asia; and throughout most of Kazakstan. In all, some 1,715,000 acres were to be planted with this variety.

A similar variety called No. 915, also descended from King, was planted in some of the upper valleys of Transcaucasia. Another variety, called No. 169, accounted for a few thousand acres in Uzbekistan and Tadjikstan. Navrotsky, a descendant of the American Russell, once a popular variety in Russia, was specified in 1937 contracts covering 139,000 acres in the central districts of Samarkand Oasis in Uzbekistan. These latter varieties have been giving place to medium-staple cotton in recent years. More than 1,000,000 acres of these three varieties were specified in 1936 contracts, but less than 300,000 acres were specified in 1937. The tendency of the last few years has been to reduce the number of varieties planted in the Soviet Union, to plant those better adapted to local conditions, and to push medium-staple cotton farther north and higher into the foothill valleys.

IMPROVING THE QUALITY OF COTTON

Soviet cotton breeders are constantly striving to develop varieties that will mature in less than 109-127 days, or that will produce longer-staple cotton. A new variety (No. 13751), which it is hoped will prove superior to the Shreder type, was being given extensive field tests in 1937 in Dagestan, just north of the Caucasus Mountains, in Stalingrad in the lower Volga Valley, and in the Ukraine.

The Soviet Government is encouraging cotton breeders and other plant breeders by paying each breeder a substantial cash premium per year for each acre planted with the particular variety developed by him. Every cotton breeder is keenly interested in producing strains that will supersede those now grown. Breeders are obligated each year to exchange their seed with other breeding stations so that a comparison of results under varying conditions may be obtained as quickly as possible.

Every station maintains its best seed of commercial varieties in isolation plots. Such seed is passed on each year for the first-year increase to selected state farms or collective farms that specialize in seed production. These farms pass the first-year increase on to other selected farms for the second-year increase, and these in turn to still larger circles of farms. Pedigreed cotton is ginned separately. The general endeavor is to plant as large a percentage of the acreage as possible each year with cotton of known parentage and to push longer-stapled and quicker-maturing strains northward in latitude and higher in altitude. These are at present the chief endeavors of the Government scientific stations and several of the state farms. A number of the large collective farms have employed cotton breeders on their own account and are working under the advice of the central stations to develop seed supply suited to local conditions.

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FUTURE DEVELOPMENTS

The problems facing the cotton breeders of the Soviet Union present many difficulties. It is to be expected, however, that better varieties of cotton will be developed than those now planted and that the quality of cotton will continue to improve. Yields per acre are also likely to improve with the spread of improved technique and increased skill among collective farmers.

While the acreage under cotton can be increased in the new regions, yields are likely to be low and the quality of the product relatively poor. It is improbable that the cotton acreage will be materially increased in Transcaucasia or Central Asia, where the best-quality cotton is produced, without the construction of costly irrigation works. There is much good land suitable for growing cotton in these regions, but the supply of water for irrigation is limited and the capacity of the irrigation systems now operating are already fully taxed to meet present requirements.

It is estimated that there are 4,621,000 acres in the Khorezm region [35] in the lower Amu Daria Valley "completely fit for irrigation," 791,000 acres requiring slight reclamation, and 1,631,000 acres requiring extensive reclamation; [36] whereas, in 1935, the seeded area in this region totaled 890,000 acres. On the Golodnaia Steppe is a large desert area suitable for irrigation. There are 1,236,000 acres of swamp land in the Fergana Valley that is suitable for drainage. It is reported that a retention dam in the upper Kura Valley would make 2,471,000 acres available for cultivation in Azerbaijan. Plans have been drawn for several other similar projects on which no actual construction work has been begun. It is probable that work on irrigation projects in Central Asia and Transcaucasia will first be directed toward improving defective systems already operating, many of which are badly in need of reconstruction, rather than undertaking major construction in order to bring significant new acreages under irrigation. Several plans were projected for development in 1937 in six districts of Uzbekistan, affecting 450,000 acres. Part of this development was designed to increase the water supply on land already under cultivation. [37] The program of the Soviet Government does not contemplate an immediate expansion of the acreage under cotton. The plan for spring planting in 1938 calls for 5,108 000 acres as compared with the similar plan for 5,163,000 acres in 1937 and with 4,979,000 acres in 1936.

Production in 1936 was apparently in excess of the planned cotton consumption of the Soviet textile industry for 1937, in which year the industry planned to produce 4,190,000,000 yards of cloth. The actual output, however, was apparently only 3,284,000,000 yards. According to the Chairman of the Council of People's Commissars, stocks of cotton in the Soviet Union at the end of the year were stated to be "considerable and such as we have never had before," whereas in previous years there were hardly any carry-over stocks and frequently difficulties were encountered in making supplies last until the end of the campaign. [38]

The new Commissar of Light Industry recently stated that the Soviet textile industry is to produce 3,900,000,000 yards of finished fabrics and 617,000 short tons of yarn in 1938. This indicates a proposed increase of 19 percent in manufactured cotton goods over the 1937 accomplishment. [39]

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[35] Includes the Khorezm Oasis of Uzbekistan, the delta of the Amu Daria in Kara Kalpak, and Tashauz district in northeastern Turkmenistan.

[36] Davis, *op. cit.*, p. 3.

[37] *Sowjetwirtschaft und Aussenhandel*, Berlin, 1937, Vol. 16, Nos. 11-12, pp. 51-53.

[38] Loyd V. Steere, Agricultural Attaché, Berlin, March 7, 1938.

[39] *Ibid.*

There is room for expansion in the manufacture of cotton goods in the Soviet Union because the per-capita consumption is undoubtedly low, although it is difficult to estimate just how low. In 1935, it was stated that the per-capita consumption of cotton was around 5.25 pounds compared with 21 pounds in the United States. In that year, mill requirement was stated to have been around 2,000,000 bales as compared with 1,750,000 bales before the World War. The 1936 requirement was stated to be 2,750,000 bales and the 1937 projected requirement 3,370,000 bales. This indicates an upward trend in the manufacture of cotton products, which has undoubtedly been accompanied by increased domestic consumption. Even today, however, there is no large per-capita consumption of cotton in the Soviet Union except in Central Asia. In other parts of the country, the people have been accustomed to wearing clothing made of wool and flax - produced, spun, and woven at home. The manufacture of cloth as a household industry has practically ceased. The degree of substitution of cotton goods for linen and woolens lies in the hands of the Government, which controls the quantities and kinds of goods that are placed on sale in retail stores.

Much is spoken and written about raising the standard of living of the masses of the people in the Soviet Union, and the degree to which this is accomplished will influence the consumption of cotton goods. The normal increase in population will also have its influence; but it is questionable whether, for some years to come, cotton requirements of the Government-owned textile industry of the Soviet Union will exceed the capacity of the farms to produce. This will depend upon the extent to which Government policy will foster domestic production of cotton and textiles. It is improbable, however, except in an unusual year, that production will result in any marked exportation of cotton to the markets of Western Europe. Thus, the Soviet Union in the near future is not likely either to export or to import cotton in any substantial volume.

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FARM-LABOR SHORTAGE IN GERMANY . . .

By H. Richter*

One of the outstanding results of the Government's program in Germany has been the virtual elimination of unemployment. The emphasis placed on the production of industrial goods, particularly armaments, however, has drawn workers to the industrial centers and created a distinct shortage of farm labor.

The shortage of farm labor that now exists in Germany seems to have become the main handicap to further expansion in German agricultural production and at present is the outstanding farm problem. On the one hand, the planned increase in gross farm production and the shift toward production of higher food value per acre of land (root crops) increase the need for farm labor. On the other hand, however, further expansion of industrial activity, both within and without the Four-Year Plan, has increased industry's demand for labor; and, since industrial occupation - judged from the broad viewpoint of general living conditions - remains relatively more attractive, industry until lately continued to attract labor from the farming communities.

This chronic "flight from the farm to the city" - only temporarily interrupted or reversed in times of industrial depression - had been going on for decades before the war. For some time and in some measure this was only a normal development. For the natural increase of the population in the country districts was larger than in the cities, while the progress in farming technique, at least in some sections of the country, reduced the demand for labor. Migration to the cities, therefore, was not excessive, except in eastern Germany, where a real lack of farm labor had been in evidence for many years before the war.

Employment of alien "seasonal" farm labor in Germany before the war was quite common and widespread in the large-scale farming districts. Importation of alien farm hands began 20 or 30 years before the World War - partly to replace domestic laborers where these, attracted by the industrial expansion, migrated too rapidly into the cities; partly to enable cultivation of more intensive crops, such as sugar beets in central Germany. The foreign labor was cheap, and the living standard of the alien farm hands was much below the German. This condition had adverse effects upon the living standard of farm workers in general, notably because few legal limitations hindered the importation into Prussia of alien farm hands between 1890 and 1914.

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Since the war, the condition of farm labor in Germany has been rather unsatisfactory, both absolutely and in comparison with the position of industrial labor. Very little has ever been done to improve the lot of the German farm laborer. Social legislation for the benifit of farm workers, as in most countries, has generally lagged behind that for the better-organized industrial workers. The disadvantage of German farm labor, therefore, was rather general and lay in the lack of opportunity to improve the laborers' status, in poor housing, low wages, and long hours, as well as in the lack of social and cultural advantages.

There has been relatively little opportunity for the German farm laborer to improve his economic and social position. The land is closely held, in recent years partly as a result of the hereditary farm legislation, and is high priced. The German rural-settlement program, of course, has made available for settlement some land, notably since the war, but only a fraction of the settlers have come from the farm-laboring classes, and the long-hoped-for land reform through partition of the large eastern estates has never been realized. In Westphalia and Holstein, respectively, the two systems of "Heuerlinge" and "Insten" give the worker his own house and land and almost raise his standing to one of a small farmer obliged to work on the estate for a specified share of his time; but these systems are limited in scope, though the officials are desirous of extending them.

The general standard of housing for German farm laborers has also been very low. The housing situation has probably always been the greatest social problem of farm labor. Landowners, with few exceptions, have been exceedingly slow to recognize that the availability and character of the farm labor they require are, in the long run, largely dependent upon the improvement of conditions for farm workers, particularly housing conditions.

These material factors - relatively low income as compared with that of the city worker, long hours of work, and a certain traditional limitation of the personal freedom of the farm laborer, as well as the very unsatisfactory housing conditions - are the major reasons for dissatisfaction among the farm workers and the continued "flight from the land." Moreover, life in German cities offers abundant entertainment to the worker compared with life in the country, though it must be admitted that the spread of ràdios and cinemas into rural districts and recent efforts made to organize a more cheerful social life in the country have tended to narrow this discrepancy.

The necessity of maintaining or even expanding agricultural production under Germany's present economic plans made authorities realize that something effective had to be done to keep agriculture supplied with enough labor. Although contrary to the Government's stable-wage policy, wage rates in agriculture have been allowed to rise during the past year or so to offset the effects of the industrial wages, which were likewise rising. It is estimated that farm wages in some places have risen as much as 20 or 30 percent over those prevailing in 1933. 1/ Strong efforts, also, are now under way to improve housing conditions for agricultural workers. Special subsidies for the building of houses for farm workers were decided upon at the end of March 1937 within a new program of active cooperation of agriculture in the Four-Year Plan. These subsidies will amount to 44 million Reichsmarks, with the rent of subsidized homes to be held on the low level of from 12 to 14 Reichsmarks monthly. The Reich Institute for Unemployment Insurance has also been instructed to grant subsidies for the erection of farm-worker houses, notably in root-crop districts, and there is no doubt that these projects are already well under way. As pointed out before, various measures have also been taken to improve the social and cultural

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1/ Bulletin of the *Hamburg World's Economics Archives*, 1938, Vol. IV, No. 8, p. 123.

attractiveness of life in the country in order to narrow the still obvious discrepancies between that and city life. As a further measure to benefit the condition of farm labor, it was recently reported that henceforth, under certain conditions, so-called marriage-aid loans for farm workers would not have to be repaid and would become State gifts if the receivers continued in agricultural occupations to the age of 30. 2/

It is hoped, probably with reason, that all these measures will contribute to the retention of the farm-labor force needed to carry out present German production plans, or at least to the maintenance of farm production at present levels. Since, however, a larger labor force is urgently needed for German agriculture - the present shortage being quite grave - additional steps have been taken to alleviate the situation. It has been decreed, for example, that the Labor Service and the youth organizations may be called upon to do compulsory service on farms in cases of emergency and soldiers may be granted farm-work furloughs. Moreover, subsidies are being paid and credits are being granted to bring about increased utilization of farm machinery, notably labor-saving machinery. Finally, this year, foreign "seasonal" farm workers are again being admitted in greater numbers - 100,000 (with an estimated total need for 200,000) as against 64,000 in 1936 and from 43,000 to 53,000 annually from 1932 to 1935.

2/ *New York Times*, March 29, 1938, p. 1.

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RECENT DEVELOPMENTS IN FOREIGN AGRICULTURAL POLICY

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SOUTH AUSTRALIA CONSIDERING WHEAT-MARKETING PLAN

A new arrangement to facilitate the marketing of wheat, known as the Cecil W. Anderson Plan, is being studied by the State Cabinet of South Australia, according to a report received in the Bureau of Agricultural Economics from American Consul Henry B. Day, at Adelaide.

The essential provisions of the plan are the pooling of all wheat, once it has been delivered by the grower for storage; the fixing of freight, storage, and handling charges; and the use of certificates showing ownership of stored wheat from time of receipt from the grower until delivered to flour millers or exporters.

An independent board representing the government, wheat growers, brokers, shippers, and millers would be set up to administer the plan. The board would have control over the marketing of the entire wheat crop of the State.

Equipment would be installed at all points where wheat is delivered to facilitate bulk weighing and handling. Farmers would receive for wheat delivered to the board a certificate showing weight and quality. Statutory deductions for freight, storage, and handling charges would be endorsed on the certificate. The board would be responsible for storing the wheat and delivering it to flour millers or to steamers.

Certificates would be purchased by shippers or millers directly or through brokers. To facilitate sales, an auction-sales system would be inaugurated at a corn exchange in Adelaide. Prices quoted on the exchange would be broadcast by the board twice daily. The buyer of a certificate would pay the farmer the f.o.b. price named in the sale, less the statutory deductions for freight, storage, and other handling charges endorsed on the certificate.

The shipper or miller purchasing the certificate would present it to the board, which in turn would deliver the quantity, quality, and grade of wheat specified thereon. The deductions for freight, storage, and handling charges would be paid to the board by the shipper or miller presenting the certificate. Shippers and millers would be allowed to sample wheat being delivered to their order. Disputes over quality would be subject to arbitration.

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ALGERIA TO REGULATE PRODUCTION OF CITRUS FRUIT

A decree recently promulgated in Algeria gives the Governor General sweeping powers to regulate and control the citrus-fruit industry in that country, according to a report received in the Bureau of Agricultural Economics from Felix Cole, American consul general at Algiers.

The decree provides that all commercial producers of citrus fruit must join regional syndicates, which in turn must be members of a union of syndicates. The regional syndicates and the union of syndicates are to be charged with the responsibility of enforcing such measures pertaining to the planting, cultivation, and control of insect pests and plant diseases and to the improvement of conditions of shipment, transportation, and sale as may be issued from time to time by the Government.

The decree provides that matters pertaining to the organization of citrus-fruit plantations into districts, the activities of the syndicates, and the levying of taxes to meet their operating costs are to be covered in separate orders issued by the Governor General.

In general, the objective of the Government is to organize and improve production and marketing methods and to eliminate or control insect pests and plant diseases.

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YUGOSLAV GOVERNMENT TO SPONSOR LAND-CONSERVATION PROJECTS

Sponsorship of land-reclamation, flood-control, and soil-improvement projects by the Government of Yugoslavia is provided for in a decree that became effective on July 1, 1938, according to a report received in the Bureau of Agricultural Economics from American Consul Charles S. Reed, 2d, at Belgrade.

The Yugoslav Minister of Public Works points out that in the past the development of projects of this type has been left largely to private initiative and that their successful completion has been hindered by difficulties in securing loans, by high interest rates, and by the necessity of making short-term payments. The Government itself as yet has engaged in no systematic land-reclamation activity.

The decree of July 1 authorizes the establishment of a permanent fund for land-conservation projects. Approximately 1,000,000 acres of fertile and workable land are said to be covered by shallow water and marshes. An equal area is subject to annual floods and, for that reason, is in large part unworkable. The Government intends eventually to reclaim all of this land for agricultural purposes.

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ARGENTINA CONSIDERING REGULATION OF FRUIT AND VEGETABLE INDUSTRY

A bill designed to give the Government a substantial measure of control over the production, transportation, marketing, and exportation of fruits and vegetables has recently been submitted to the Argentine Congress by the Ministry of Agriculture, according to a report received in the Bureau of Agricultural Economics from its Buenos Aires office.

Under the terms of the bill, the Government would be authorized to determine the varieties of fruits and vegetables that may be grown and the particular regions most suitable for their production and to prescribe grades, standards, type of pack, and other conditions for their legal sale and exportation.

One of the most important sections of the bill is that which provides for the appropriation of 5,000,000 pesos ($1,650,000) for the construction and equipment of fruit-packing houses, regional precooling plants, cold-storage houses, and fruit-drying plants. These funds are to be made available to cooperative associations under conditions prescribed in the bill.

Another significant provision of the bill is that specifying a minimum wage of 4.20 pesos ($1.40) a day for persons engaged in the packing and processing of fruit. The wages of farm labor permanently employed in the fruit-growing industry would not be less than 2.00 pesos (66 cents) per day when provided with room and board, or 3.20 pesos ($1.06) per day without room and board.

Funds for the administration of the law by the Argentine Bureau of Fruits and Vegetables would be obtained from a tax of not more than 3 centavos on each container of produce or from a weight tax, not yet stipulated, if the produce is shipped in bulk.

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MEXICAN PRODUCERS TO CONTROL STOCKS OF IXTLE FIBER

In Mexico, a plan to reduce, and to prevent further, accumulations of stocks of ixtle fiber, without at the same time necessitating a reduction in production, has been adopted by the Nacional Ixtlera, a cooperative society having a virtual monopoly of the industry, according to a report received in the Bureau of Agricultural Economics from American Consul Edmund B. Montgomery, at San Luis Potosi.

The plan provides for continuing production on the existing scale and, in addition, by levying charges against each member of the cooperative, for the destruction each year of 60 carloads (about 1,200 short tons) of stocks. The plan is not to be put into operation at once, since a reduction in stocks has been taking place this year, partly through the cessation of production by some growers and partly because production has been decreased by heavy rains.

While no decision has been made as to when the partial destruction of stocks will begin, a fund is being accumulated to finance the plan. This fund is obtained through the assessment of a tax on each member of the cooperative. Approximately 800,000 pesos ($160,000) has already been accumulated for that purpose.

Of an annual production of approximately 600 carloads (12,200 short tons) of ixtle fiber in Mexico, it is estimated that, under existing demand conditions, there is an overproduction of about 10 percent. Reduced production was not considered feasible, since the wages from gathering ixtle fiber constitute practically the only source of livelihood for several thousand peasants during dry years. Much of the present overproduction is attributed to the continued collection of ixtle during 1936 and 1937, when the usual rainy spells did not occur.

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